

Practical Paths of High School Mathematics Large Unit Teaching Design under the Background of the "Three News": A Case Study of Hezhou No.1 Senior High School

Qingzhong Wei¹, Heyin Su²

¹Hezhou No.1 Senior High School, Hezhou, Guangxi, China

²Yulin Donghuan Primary School, Yulin, Guangxi, China

Abstract: With the in-depth advancement of the reform of the new curriculum, new textbooks and new college entrance examination (hereinafter referred to as the "Three News"), entirely new requirements have been put forward for mathematics teaching in ordinary senior high schools. Breaking the traditional fragmented teaching mode and constructing a systematic large unit teaching design system has become a key measure to implement the core literacy of mathematics and connect with the orientation of the new college entrance examination. Taking the mathematics teaching practice of Hezhou No.1 Senior High School (hereinafter referred to as Hezhou No.1 High School) as the research carrier, this paper defines the core concepts and basic principles in combination with the school's running characteristics and the characteristics of students' learning situation, analyzes the common problems and their causes in the current teaching through questionnaire and interview surveys, explores the practical paths suitable for the actual situation of key county senior high schools, and provides practical references for the mathematics teaching reform of ordinary senior high schools under the background of the "Three News".

Keywords: The Background of the "Three News"; Senior High School Mathematics; Large Unit Teaching Design; Practical Paths

1. Introduction

1.1 Research Background

With the full implementation of the *General High School Mathematics Curriculum Standard (2017 Edition, Revised in 2020)* (hereinafter referred to as the *2020 Revised Curriculum Standard*), the mathematics teaching in China's

senior high schools has stepped into a stage of in-depth reform oriented by "core literacy". The "Three News" reform is interrelated and organically unified: the new curriculum takes establishing morality and cultivating people as the fundamental task, and clarifies the cultivation objectives of the six core literacy such as mathematical abstraction and logical reasoning; the new textbooks restructure the knowledge framework with "themes", strengthen the relevance and practicality of knowledge, and add content close to life and the new college entrance examination; the new college entrance examination adheres to the ability-oriented principle, and the propositions show the characteristics of "comprehensiveness and contextualization". In the 2023 national college entrance examination papers, cross-module comprehensive questions accounted for more than 35%, putting forward higher requirements for students' systematic knowledge system [1].

As a key county senior high school in Hezhou City, Hezhou No.1 High School ranks in the forefront of the region in terms of school-running strength, but it still faces pain points in the "Three News" reform: teachers are used to fragmented lesson preparation, and students' knowledge system is loose; some teachers have a superficial understanding of large unit teaching and only simply splice chapters; the teaching design is not closely connected with the new college entrance examination, making it difficult to adapt to the reform requirements. Against this background, exploring the path of large unit teaching with this school as the carrier can not only improve its teaching quality, but also provide reference experience for similar senior high schools in the region [2].

1.2 Research Significance

1.2.1 Theoretical significance

It enriches the theoretical system of senior high

school mathematics large unit teaching design under the background of the "Three News", improves the implementation framework in combination with the learning situation of county senior high schools, makes up for the deficiencies of the current research such as "emphasizing theory over practice" and "focusing on urban schools while neglecting county schools", deepens the understanding of the cultivation path of core literacy, and provides support for subsequent research[1][2].

1.2.2 Practical significance

For Hezhou No.1 High School, it can transform teachers' teaching philosophy, solve teaching problems, and improve teaching quality and students' core literacy; for similar senior high schools in the region, it provides operable practical paths and promotes the coordinated development of regional teaching; for students, it helps them construct a systematic knowledge system, improve their learning ability and the examination-taking level for the college entrance examination, and lay a foundation for lifelong learning [2].

1.3 Research Status at Home and Abroad

1.3.1 Foreign research status

Foreign research on unit teaching started early and formed a mature paradigm: Dewey put forward the pragmatist unit teaching mode, emphasizing situation-driven and practical experience; Kilpatrick developed the "project method", arranging learning units with students' activities; Bruner's structuralism theory emphasized the structuring of disciplinary knowledge, providing support for large unit teaching. The American UBD model, Japanese unit whole teaching, and Finnish theme-based unit design all pay attention to systematicness and subjectivity, but they cannot be directly copied in China's practice due to differences in educational systems and students' learning situations.

1.3.2 Domestic research status

Domestic research focuses on the connection between large unit teaching and the "Three News", the orientation of core literacy, etc. Scholars such as Shao Chaoyou, Cui Yunhuo and Liu Hui have defined the core connotations of big ideas and large units [3][4]; the famous teacher studios of Yu Tao and Sun Pengfei have put forward relevant implementation strategies and cases. However, there are still deficiencies in the research: emphasizing theory over

practice with poor operability; focusing on famous urban schools while ignoring the learning situation of county senior high schools; and the connection with the new college entrance examination is not in-depth enough. Taking Hezhou No.1 High School as the carrier, this paper makes up for the above shortcomings and has strong practical pertinence [2].

1.4 Research Methods and Ideas

1.4.1 Research methods

A variety of methods are adopted to ensure the scientificity and effectiveness of the research[2-4]: (1) Literature research method: combing the relevant literature and policies of the "Three News" reform and large unit teaching to lay a theoretical foundation; (2) Survey research method: distributing 32 teacher questionnaires (with an effective recovery rate of 93.75%) and 500 student questionnaires (with an effective recovery rate of 97.2%), interviewing 10 teachers and 20 students to grasp the actual situation; (3) Action research method: relying on the mathematics teaching and research group of Hezhou No.1 High School, improving the practical path through the cycle of "design-implementation-reflection-optimization"; (4) Case analysis method: selecting different mathematics module cases of the school to verify the effectiveness of the path [5].

1.4.2 Research ideas

Following the idea of "theoretical combing - current situation investigation - problem analysis - path exploration - case verification - reflection and improvement", the research is carried out step by step: first define the core concepts and principles, then investigate the current situation and problems of Hezhou No.1 High School, then explore and verify the practical paths [6], and finally summarize and reflect, put forward suggestions to form a complete research system.

2. Definition of Core Concepts and Basic Principles

2.1 Definition of Core Concepts

2.1.1 The background of the "three news"

It refers to the reform background of the coordinated advancement of the new curriculum, new textbooks and new college entrance examination: the new curriculum implements the fundamental task of establishing morality and cultivating people, highlighting the

cultivation of core literacy and the dominant position of students; the new textbooks are based on the 2020 Revised Curriculum Standard[7][8], integrate knowledge with "themes", and pay attention to practicality and hierarchy[9]; the new college entrance examination adheres to the ability-oriented principle, examines students' thinking quality and application ability through contextualized and cross-module test questions, and has a guiding role in teaching.

2.1.2 Senior high school mathematics large unit teaching design

Oriented by the core literacy of mathematics [8], based on the requirements of the "Three News" and combined with the students' learning situation, it is an integrated teaching plan of "objective-content-process-evaluation" formed by systematically integrating and reconstructing the teaching content. Its core characteristics are integrity, relevance, literacy and practicality. It is not a "superposition of class hours" or "splicing of chapters", but a teaching unit with strict logic, suitable for students' learning situation and the new college entrance examination constructed with big ideas as the core, which solves the drawbacks of fragmented teaching.

2.2 Basic Principles

2.2.1 The principle of core literacy orientation
Integrate the six core mathematical literacy into all links of unit objectives, teaching content, process and evaluation, clarify the key points of literacy cultivation for each unit and class hour, and realize the organic unity of "knowledge imparting" and "literacy cultivation" [8][10]. For example, the large unit of "Functions" focuses on cultivating the literacy of mathematical abstraction, logical reasoning and mathematical modeling [10].

2.2.2 The principle of integrity and relevance
Based on the overall mathematical knowledge system, break the boundaries of class hours and chapters, integrate teaching content to ensure the coherence of knowledge within and between units; pay attention to the connection of knowledge, the connection between objectives and teaching processes, and the connection between large units and the new college entrance examination, closely follow the proposition orientation, and improve students' examination-taking ability. For example, integrate "Trigonometric Functions" and

"Solving Triangles" into a large unit, and design teaching in line with the characteristics of the new college entrance examination questions.

2.2.3 The principle of adapting to students' learning situation

Combined with the learning situation of Hezhou No.1 High School where "students have a solid foundation and distinct levels, but some students are weak in thinking flexibility and application ability", set reasonable objectives, integrate content, design activities and implement hierarchical teaching. For example, design basic, expanded and challenging task packages for the unit of "Sequences" to meet the needs of students at different levels [5].

2.2.4 The principle of practicality and inquiry

Combine the reality of life with the characteristics of mathematics, design practical inquiry activities, guide students to explore independently and communicate cooperatively, strengthen the application of knowledge, and cultivate the sense of inquiry and innovative ability. For example, design a campus consumption survey activity for the unit of "Probability and Statistics", and a family financial management situation for the unit of "Application of Functions", which are in line with the orientation of new textbooks and the new college entrance examination [2].

2.2.5 The principle of scientificity and operability

The teaching design conforms to the requirements of the "Three News" and the cognitive laws of mathematics and students, ensuring reasonable objectives, scientific content and clear processes; it is suitable for the school-running conditions and teachers' professional level of Hezhou No.1 High School, and the teaching methods are simple and feasible, easy for teachers to popularize and apply in daily teaching, ensuring the effective implementation of large unit teaching.

3. Current Situation and Problem Analysis of Senior High School Mathematics Large Unit Teaching Design in Hezhou No.1 High School

3.1 Survey Overview

Combining questionnaires and interviews, a survey was conducted among mathematics teachers and students from Grade 1 to Grade 3 of Hezhou No.1 High School: the teacher questionnaire focused on the cognition of the "Three News", the implementation and puzzles

of large unit teaching; the student questionnaire focused on the cognition, learning experience and effect of large unit teaching; the interview focused on understanding the difficulties and suggestions faced by teachers and students, so as to fully grasp the implementation status and problems[2].

3.2 Implementation Status

3.2.1 Teacher level

86.7% of teachers have a clear understanding of the core requirements of the "Three News" reform, and 73.3% have a clear understanding of the connotation and significance of large unit teaching; 76.7% of teachers have tried to carry out large unit teaching, concentrated in the new textbook modules of Grade 1 and Grade 2 of senior high school, and backbone teachers take the lead in designing high-quality cases and promoting them; 66.7% of teachers have participated in relevant training and teaching research on large unit teaching, and their teaching ability has been improved to a certain extent.

3.2.2 Student level

79.4% of students understand the large unit teaching mode, and 72.2% believe that large unit teaching can help construct a knowledge network and improve learning effects, and they prefer the teaching methods of "independent inquiry and cooperative communication"; 68.3% of students said that through large unit teaching, their understanding of knowledge is more in-depth, and their problem-solving ability and application ability have been improved, especially in modules such as functions and solid geometry, and their learning confidence has been significantly enhanced[2][10].

3.3 Main Existing Problems

3.3.1 Teacher level

(1) Cognitive deviation: 26.7% of teachers simply equate large unit teaching with "chapter summary" or "class hour superposition", lacking knowledge reconstruction and literacy objective positioning, insufficient ability to extract big ideas, and the teaching design lacks core guidance. (2) Inadequate design ability: 53.3% of teachers have problems such as inaccurate unit objectives, unreasonable knowledge integration, unscientific process design, insufficient research on the propositions of the new college entrance examination, loose connection with the college entrance

examination, and inadequate implementation of hierarchical teaching. (3) Insufficient innovation in teaching methods: 60% of teachers still use the traditional "lecture-based" teaching, insufficient application of new teaching methods, formalistic inquiry activities, and the dominant position of students has not been fully exerted.

3.3.2 Student level

56.8% of students have weak independent inquiry and cooperation abilities, making it difficult to take the initiative to participate in inquiry activities; 47.7% of students have insufficient ability to integrate and apply knowledge, and cannot flexibly use knowledge to solve comprehensive problems; 38.5% of underachieving students have low participation, and the development needs of top students have not been met.

3.4 Causes of Problems

At the teacher level: constrained by traditional teaching thinking, insufficient targeted training, imperfect teaching research support, and in-depth research on students' learning situation and the new college entrance examination. At the student level: solidified learning habits, lack of awareness of independent inquiry, and great differences in foundation and ability. At the school and external level: imperfect guarantee mechanisms and insufficient support from external teaching and research resources, making it difficult to meet the needs of teaching practice.

4. Practical Paths of Senior High School Mathematics Large Unit Teaching Design under the Background of the "Three News" (A Case Study of Hezhou No.1 High School)

4.1 Update Teaching Philosophy and Lay a Solid Ideological Foundation

Strengthen the concept guidance, interpret the requirements of the "Three News" and the connotation of large unit teaching through special training, famous teacher lectures, teaching and research discussions and other activities, and transform teachers' traditional teaching thinking; set up a research team with backbone teachers as the core, establish a support mechanism, combine the experience of the school's famous teacher studio, learn from high-quality external achievements, gather the joint efforts of teaching and research, and

improve teachers' cognitive level of large unit teaching.

4.2 Precisely Set Unit Objectives and Anchor the Direction of Literacy

Based on the six core mathematical literacy, combined with the requirements of the *2020 Revised Curriculum Standard* and the orientation of the new college entrance examination, set the overall unit objectives; divide the objectives into three levels: basic, improved and expanded in combination with the learning situation of Hezhou No.1 High School to meet the needs of different students; pay attention to the connection between unit objectives and the preceding and following units, ensure the coherence of knowledge and the continuity of literacy cultivation, and achieve the dual objectives of "literacy cultivation" and "college entrance examination

connection".

4.3 Systematically Integrate Unit Content and Construct a Knowledge System

Based on the "themes" of the new textbooks, combined with the internal logic of knowledge and the orientation of the new college entrance examination, divide large units, reconstruct teaching content, sort out the knowledge context, and build a systematic knowledge network; optimize the content difficulty in combination with students' learning situation, delete redundant knowledge points, strengthen core knowledge and comprehensive application content, and ensure that the content is suitable for teachers' teaching ability and students' learning level. The division of large units of senior high school mathematics in Hezhou No.1 High School is shown in Table 1 as follows:

Table 1. Key Points of Stage Stratification

Stage	Name of Large Unit	Integrated Textbook Content (People's Education Press Version A)	Key Points of Core Literacy Cultivation
Grade 1, Senior High School (First Semester)	Sets and Common Logical Terms	Compulsory Volume 1, Chapter 1	Mathematical Abstraction, Logical Reasoning
Grade 1, Senior High School (First Semester)	Concepts and Properties of Functions	Compulsory Volume 1, Chapter 2	Mathematical Abstraction, Logical Reasoning, Intuitive Imagination
Grade 1, Senior High School (First Semester)	Basic Elementary Functions	Compulsory Volume 1, Chapter 3	Mathematical Abstraction, Mathematical Operation, Intuitive Imagination
Grade 1, Senior High School (Second Semester)	Trigonometric Functions and Solving Triangles	Compulsory Volume 2, Chapters 5 & 6	Mathematical Operation, Logical Reasoning, Mathematical Modeling
Grade 1, Senior High School (Second Semester)	Sequences	Compulsory Volume 2, Chapter 7	Mathematical Abstraction, Logical Reasoning, Mathematical Operation
Grade 2, Senior High School (First Semester)	Solid Geometry and Space Vectors	Elective Compulsory Volume 1, Chapter 1	Intuitive Imagination, Logical Reasoning, Mathematical Operation
Grade 2, Senior High School (First Semester)	Analytic Geometry	Elective Compulsory Volume 1, Chapters 2 & 3	Intuitive Imagination, Mathematical Operation, Logical Reasoning
Grade 2, Senior High School (Second Semester)	Probability and Statistics	Elective Compulsory Volume 2, Chapters 4 & 5	Data Analysis, Mathematical Modeling, Logical Reasoning
Grade 3, Senior High School	Mathematical Modeling and Comprehensive Application	Application-oriented content of each module, real questions of the new college entrance examination	Mathematical Modeling, Comprehensive Application Ability, Innovative Awareness

4.4 Scientifically Design the Teaching Process to Ensure Orderly Progress

Construct a trinity teaching process of "pre-class preparation - in-class implementation -

after-class expansion": before class, teachers thoroughly study the curriculum standard and textbooks, analyze students' learning situation, complete the overall design of large units, and assign preview tasks; in class, advance in four

links of "situation introduction - core inquiry - consolidation and improvement - summary and combing" to stimulate students' interest and implement teaching objectives; after class, assign hierarchical homework, carry out extracurricular inquiry activities, guide students to consolidate knowledge and improve application ability, forming a closed loop of "preview - learning - consolidation - improvement".

4.5 Innovate Teaching Methods and Stimulate Students' Learning Initiative

Break the traditional lecture-based teaching, and promote independent inquiry method, cooperative learning method, situational teaching method and hierarchical teaching method: design targeted inquiry activities to guide students to think independently and communicate cooperatively; combine life and college entrance examination situations to enhance the interest and practicality of teaching; design learning tasks and homework of different difficulties according to students' levels to ensure that every student can make progress. For example, in the unit of "Probability and Statistics", improve students' data analysis literacy through campus consumption survey activities; in the unit of "Functions", design inquiry question chains to cultivate students' logical reasoning ability.

4.6 Optimize the Evaluation Method and Improve the Feedback Mechanism

Construct a diversified evaluation system of "process evaluation + summative evaluation": process evaluation focuses on students' in-class participation, performance in inquiry activities and homework completion to fully grasp the students' learning process; summative evaluation is mainly based on unit tests and monthly exams, focusing on examining students' knowledge application ability and the development level of core literacy. Establish an evaluation feedback mechanism, timely analyze the evaluation results, find problems in teaching and learning, optimize teaching design and learning guidance, and form a virtuous circle of "evaluation - feedback - optimization - improvement".

4.7 Strengthen Guarantee and Support to Promote Effective Implementation

The school improves the guarantee mechanism,

sets up a special fund for large unit teaching, sets up a research team to provide financial and human support for teaching practice; strengthens teachers' training, organizes teachers to participate in various levels of training and high-quality lesson evaluations, carries out in-school collective lesson preparation and case discussions to improve teachers' teaching design and implementation abilities; builds an inter-school exchange platform, integrates internal and external teaching and research resources, learns from the excellent experience of similar schools, and promotes the high-quality development of large unit teaching.

4.8 Practical Case Verification

Select the large unit of "Trigonometric Functions and Solving Triangles" in Hezhou No.1 High School, and design the teaching according to the above paths: clarify the cultivation objectives of core literacy, integrate textbook content, design links such as situation introduction and inquiry practice, and implement hierarchical teaching and diversified evaluation. Practice shows that the average test score of students in this unit has increased by 12.3 points compared with traditional teaching, 82.1% of students think the knowledge relevance is clearer, and 75.6% of students say their problem-solving ability and application ability have been significantly improved, which verifies the effectiveness and feasibility of the practical path.

5. Practical Reflection and Improvement Suggestions

5.1 Practical Reflection

The practice of large unit teaching in Hezhou No.1 High School has achieved certain results: teachers' teaching philosophy and design ability have been improved, students' learning effects and core literacy have developed, and the teaching quality has been steadily improved. However, there are still deficiencies: some teachers have insufficient ability to integrate knowledge and extract big ideas, and the implementation of hierarchical teaching is not accurate enough; the evaluation system still needs to be improved, and the pertinence and operability of process evaluation need to be enhanced; the effectiveness of some inquiry activities is insufficient and needs to be further

optimized.

5.2 Improvement Suggestions

Based on the above discussion, the following four improvement suggestions are put forward: 1. Strengthen the special training of teachers, focus on key points such as knowledge integration, big idea extraction and hierarchical teaching, and improve teachers' teaching design ability; 2. Refine the evaluation indicators, improve the diversified evaluation system, enhance the pertinence and operability of process evaluation, and ensure the fairness and comprehensiveness of evaluation; 3. Optimize the design of inquiry activities, combine the students' learning situation and the orientation of the college entrance examination, improve the effectiveness and pertinence of activities, and stimulate students' interest in inquiry; 4. Strengthen inter-school exchanges and cooperation, learn from the experience of high-quality schools, dynamically optimize the large unit teaching design in combination with the learning situation of Hezhou No.1 High School, and promote the improvement of teaching quality and efficiency.

Acknowledgments

This paper is supported by the research project "Practical Research on Large Unit Teaching Design of Ordinary Senior High School Mathematics under the Background of the New Curriculum, New Textbooks and New College Entrance Examination — A Case Study of Hezhou No.1 Senior High School" (No.2023c771).

References

- [1] Zhang D Z, Song N Q. *New Curriculum Concepts and Teaching Practice of Senior High School Mathematics*. Beijing: Higher Education Press, 2020.
- [2] Wei Q X. Research on the Design Path of Large Unit Teaching of Senior High School Mathematics under the Background of the "Three News". *Science Fans*, 2025, (02): 7-9.
- [3] Cui Y H, Shao C Y. *Large Unit Teaching Design Oriented by Core Literacy*. *Global Education Outlook*, 2020, 49(06): 3-10.
- [4] Liu H. *Big Idea Teaching: Unit Whole Design Oriented by Literacy*. Shanghai: East China Normal University Press, 2020.
- [5] Yu H F. Design and Practice of Large Unit Teaching of Senior High School Mathematics Based on Deep Learning — A Case Study of "Derivatives". *Tianjin Education*, 2024, (35): 26-28.
- [6] Liu S C, Huang Y. Practical Paths of Large Unit Teaching Design for Senior High School Ideological and Political Courses. *Moral Education in Primary and Secondary Schools*, 2025, (06): 49-53.
- [7] Yu T. Senior High School Mathematics Unit Teaching Strategy Centered on Big Ideas. *Journal of Mathematics*, 2021, 60(08): 28-32.
- [8] Sun P F. Design and Implementation of Senior High School Mathematics Large Unit Teaching Oriented by Core Literacy. *Journal of Chinese Education*, 2022(S1): 189-190.
- [9] Wang G M. *Cultivation Paths and Practical Exploration of Core Literacy in Senior High School Mathematics*. Tianjin: Tianjin Education Press, 2021.
- [10] Hu J D, Zhang B. Design and Practice of Large Unit Teaching of Senior High School Mathematics from the Perspective of Improving Mathematical Abstraction Literacy. *Friends of Mathematics*, 2025, (09): 26-28+31.